REMARKS

In the above reference case, Claims 21-40 are pending. Applicants thank for the Examiner's thorough examination of the pending claims and thoughtful comments. Applicants will sequentially address the issues raised by the Examiner.

I. Claim Objections

Claims 37 are 38 are objected to under 37 CFR § 1.75(c). In this paper, claims 37 and 38 have been amended to be proper dependent claims as a system to claim 36. Therefore, Applicants respectfully request that the objections to claims 37 and 38 be withdrawn.

II. The 35 U.S.C. § 103 Rejections

Claims 21-27, 29, 31-34 and 36-39 were rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over MSC Technical Paper, MSC Software, "Nonlinear FEA of elastomers" (hereinafter "MSC") in view of Gallagher et al., "An efficient 3-D visualization technique for finite element models and other coarse volumes" (hereinafter "Gallagher'). Claims 28, 30, 35 and 40 were rejected 35 U.S.C. § 103(a) as allegedly being unpatentable over MSC in view of Gallagher and further in view of Peric et al., "Finite-Element applications to the non-linear mechanics of solids" (hereinafter "Peric"). Applicants respectfully traverse the rejections.

A. Independent Claim 21

It is axiomatic that the combination of cited references in a §103 rejection must disclose every element in the rejected claim. MPEP 2143.03. Claim 21 is amended in the forgoing amendment to further distinguish from the cited reference. As amended, Claim 21 recites:

> calculating a plurality of stress function f(λ) values **without guessing unknown material coefficients μ and α to fit the strain-stress curve in a trial-and-error manner**, wherein each of the plurality of stress function values equals to summation of a sequence of $\lambda^{[-\upsilon]^j}\ \sigma_0\left(\lambda^{[-\upsilon]^j}\right)$, where j is an integer related to j-th term of the sequence, λ is a particular stretch ratio of interest, ν is Poisson's ratio of the compressible material, and $\sigma_0\left(\lambda^{[-\upsilon]^j}\right)$ is the stress value at $\lambda^{(-\upsilon)^j}$ defined by stress-strain curve for the compressible material;
>
> storing the plurality of stress function values into a lookup table;

(*Emphasis added*)

As clearly shown in FIGS. 2 and 3 and the corresponding descriptions thereof in the Specification, evaluation of Equations 350 and 360 listed in FIG. 3 does not require the unknown material coefficients μ and α. In other words, to evaluate stress function, a user does not need to guess unknown material coefficients μ and α to fit the strain-stress curve in a trial-and-error manner. In order perform the subsequent step in claim 21: "storing the plurality of stress function values into a lookup table", only if the stress function values are calculated using Equations 350 and 360. Otherwise, it is impossible to store any values into a lookup table.

Using the prior art solutions, a user needs to define a stress-strain (i.e., a stress versus stretch ratio) curve, which is typically used with a nonlinear least squares fit (i.e., trial-and-error manner) to determine the unknown Ogden material coefficients μ and α. Unless many terms are used in the Ogden equation, which is extremely difficult to fit, accuracy is poor. With the new technique disclosed in the present invention, users iteratively generate a lookup table without the need to guess unknown material coefficients μ and α. The new technique is far more accurate and eliminates the trial-and-error fitting to evaluate the Ogden equations (i.e., stress function). The new technique has never been published in the literature and is completely new.

In contrast, MSC teaches the traditional problematic method, the trial-and-error curving fitting technique, that the present invention was invented to overcome. The motivations of the present invention are clearly described in Paragraph [0009] of the Specification, which is reproduced below:

[0009] Today, there are a number of practical problems associated with the simulation of foam-like material in FEA. To implement the Ogden energy function properly in the FEA software requires engineers to spend a tremendous amount of time to prepare experimental data and then convert them into a set of coefficients to fit a polynomial Ogden function for FEA software. Due to highly non-linear characteristics of this polynomial function, the inexactly fitted function has often resulted. This leads to a lengthy iterative trial-and-error process of modifying the input coefficients to match the behavior of foam-like material in the real world. …

Using the prior art method listed in page 8 of MSC, a user cannot directly calculate discrete stress function values that Equations 350 and 360 in FIG. 3 of the Specification are derived for. As a result, no discrete stress function values can be stored into a lookup table in accordance with MSC. Therefore, MSC fails to teach or suggest: "without guessing unknown material coefficients μ and α to fit the strain-stress curve in a trial-and-error manner".

In addition, effective and efficient simulation of compressible material is a long-felt need in the field of computer aided engineering using finite element analysis. An Affidavit dated Feb. 1, 2007 under 37 CFR § 1.132 is submitted and attached with this paper (see III. below and the attached Affidavit) by Dr. Kelly S. Carney, an expert in the field of computer aided engineering, finite element analysis, and numerical simulation of compressible material. The Affidavit clearly indicates that the traditional method is prohibitively slow. Certain simulation requires several weeks for an industry application to converge to a set of coefficients that fits the test data. (#4 Affidavit). And none of the prior art solutions can provide an exact fit of the test data. (#12 Affidavit).

Furthermore, Applicants agree with the Examiner that MSC fails to teach "storing the plurality of stress function values into a lookup table and evaluating element stresses in a local coordinate system from the lookup table in accordance with a set of principal stretches at each integration point of each of the finite elements." OA page 4 lines 4-7. Gallagher was then cited for allegedly disclosing steps of "storing … and evaluating …". And the Examiner asserted that MSC and Gallagher are allegedly analogous art because they are both related to finite element analysis. Applicants respectfully disagree with the Examiner. Finite element analysis is a tool used in computer aided engineering. It can be used in many disciplines as described in Paragraph [0004] of the Specification. MSC teaches techniques and methods used in simulating elastomers. Gallagher teaches techniques used in computer visualization. Gallagher is not related to numerically simulating compressible materials at all. Therefore, Applicants respectfully submit that MSC and Gallagher are not analogous hence the combination in manner proposed by the Examiner is respectfully traversed.

In addition, Applicants respectfully submit that there is no motivation or suggestion to combine the teachings of MSC and Gallagher in the manner proposed by the Examiner. Nevertheless, even if MSC and Gallagher were to be combined, the combination would still fail to teach or suggest the features recited in the amended claim 21.

Given the fact that the combined features in the amended claim 21 are neither taught nor suggested in MSC and Gallagher, viewed alone or in combination, Applicants believe that claim 21 shall be allowable over the cited references. Reconsideration of claim 21 is respectfully requested.

B. Independent Claims 31 and 36

Independent claims 31 and 36 are amended to incorporate similar features recited in claim 21 and were also rejected for the similar alleged reasons as for claim 21. Applicants would like to apply the above remarks for claim 21 to support claims 31 and 36 also. Reconsideration of claims 31 and 36 is respectfully requested

C. Dependent Claims

Dependent claims 22-30 are dependent upon claim 21, claims 32-35 are dependent upon claim 31, claims 37-40 are dependent upon claim 36, and contain additional limitations further distinguish them from MSC, Gallagher or Peric, viewed alone or in combination. Therefore, claims 22-30, 32-35 and 37-40 shall be allowable for at least the reasons stated above with regard to independent claim 21.

In addition, Peric is cited to reject claims 28, 30, 35 and 40 in conjunction with MSC and Gallagher. Applicants respectfully contest that there is no motivation or suggestion in such combination. Nevertheless, even if these references were to be combined, the combination would still fail to teach or suggest the features in these claims including limitations recited in claim 21.

III. Affidavit submitted under 37 CFR § 1.132

Attached to this amend is an Affidavit, dated Feb. 1, 2007, by Dr. Kelly S. Carney to establish the present invention is a long-felt need in the numerically simulation of compressible materials (e.g., foam, rubber, etc.) in a finite element analysis (i.e., computer aided engineering). The Examiner is respectfully requested to review the Affidavit and to consider the Affidavit as objective evidence. MPEP 2141 III. Based upon the statements made in the Affidavit, Applicants respectfully submit that all pending claims in the instant application are non-obvious based on the secondary considerations thereby claims 21-40 shall be allowable over the cited references.

SUMMARY

In view of the forgoing, Applicants believe that all pending claims in this application are in condition for allowance. Early and favorable action is respectfully solicited.

If there are any issues remaining which the Examiner believes could be resolved through either a Supplementary Response or an Examiner's Amendment, the Examiner is respectfully requested to contact the undersigned at (408) 255-6853.

No fee is believed to be required for this amendment, if it is determined that a fee is due in connection with this paper, the Commissioner is hereby authorized to charge payment of any fees associated with this communication or credit any overpayment, to Deposit Account No. 553308, including any filing fees under 37 CFR § 1.16 for presentation of extra claims and any patent application processing fees under 37 CFR § 1.17.

Respectfully submitted,

I hereby certify that this correspondence is being transmitted to the Commissioner for Patents via the Office electronic filing system on the date stated below.

Date: Feb. 27, 2007

Signature: /Roger H. Chu, Reg.# 52745/
Roger H. Chu

/Roger H. Chu, Reg.# 52745/

Roger H. Chu
Registration No. 52,745